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Working paper on the concept of amplified verification in relation to the prohibition of chemical weapons

The principal role of verification in disarmament treaties

The use of control methods is stipulated in a treaty in order to verify that the parties comply with their undertakings under that treaty. General models for different types of control can be worked out. However, the conditions in the field to be covered by a treaty determine the actual verification measures to be stipulated. This can be exemplified briefly: with regard to the comprehensive test ban, only one control measure (detection of underground explosions) is discussed; with regard to nuclear material, control of the production of only one substance (down to kilogram quantities) by means of several methods is discussed. In contrast, a possible treaty prohibiting the development, production and stockpiling*/ of chemical agents of warfare will have to employ several control methods, covering not only several activities but also (tons of) many different chemical substances. This fact implies not only that usual decision theories are not easily applicable, but also that the question of false alarms must be given special attention. A discussion of these two aspects is attempted in the following. Practical and political implications are considered.

The role of verification in a ban on DPS of chemical agents of warfare

A chemical DPS ban covering several chemical agents will require several different control methods. This has become quite clear from the discussions in the CCD.

It has been argued, although no consensus has been reached so far, that the primary purpose of the many possible control methods in a future chemical ban should be to trigger some kind of procedure to establish whether a violation of the treaty has occurred or not. Furthermore, no agreement has been reached whether this procedure should involve on-site inspection or be restricted to some less intrusive

*/ The expression "development, production and stockpiling" is in the following abbreviated "DPS".

procedure. This part of the verification process will not be discussed in this paper. It is, however, assumed that the control methods discussed in the following are to be managed by an international control organization, using e.g. nationally gathered information for the purpose of control, as may be agreed upon in a treaty.

The necessity of using many control methods and the uncertainty as to the form for establishing a treaty violation makes it insufficient to consider the kind of discriminatory decision levels generated by a single verification measure which would apply in the case of the comprehensive test ban. Instead, it will be necessary to consider the effects of several verification measures in combination; in other words, to evaluate the amplified verification described later in this paper.

Amplification of verification efficiency

Much discussion has been devoted to how effective a non-intrusive method for the verification of the compliance with a disarmament treaty should be in order to deter its parties from violating the treaty, when subsequent on-site inspection is allowed or not, as the case may be. There seems to be consensus that the verification methods need in no case be 100 per cent effective.

Less attention seems to have been focused on the consequences of using several independent methods of verification, each with limited prospects of success, in revealing a violation. This is commented upon in the following, with special reference to the attempts to agree upon a ban on the DPS of chemical agents of warfare.

It is intuitively felt that the use of several independent methods of verification should increase the possibility of detecting treaty violations. Such an increase can easily be shown formally by applying a simple mathematical reasoning about probabilities. (See J. Lundin, Considerations on a chemical arms control treaty and the concept of amplified verification, FOA Reports 7:1 (1973) 1 - 5.)

To illustrate the effect of the amplification of the verification, one may consider the hypothetical situation concerning a ban on the DPS of chemical warfare agents given below. The revealing probabilities given in the example may be too high to be realistic, but then more methods can be introduced under the headings given. In a real case the given "revealing probabilities" should be evaluated by relevant experts, as discussed later.

Elements contained in an assumed prohibition of chemical arms and hypothetical verification results of their application

Forbidden activity	Possible verification method	Hypothetical values of revealing probabilities
Development		
Research on supertoxic substances, antidotes	Scanning literature by computer	0.03
Field tests	Remote sensing from satellites	0.1 */
Production	Statistical survey of export-import data for basic chemicals, e.g.	
	Phosphorus	0.03
	Phosphorus trichloride	0.03
Stockpiling	Finding instructions for handling of chemical munition	0.03
Training	Finding manuals on offensive use of chemical munition	0.01

*/ Cf. CCD/371, 1972.

False alarms

Evidently, the political drawbacks of a false alarm due to the performance of a control method are serious. That a nation, because of imperfect technical means, can be falsely accused of violating a treaty may to some parties be more objectionable than being left with a verification method that cannot detect every violation committed by other parties. It is thus important that the verification results be presented in a way that cannot be interpreted as an accusation. To achieve this is one of the aims of the verification model discussed in this paper.

It is assumed that the function of the accumulating circumstantial evidence from the several verification methods shall be to trigger such further investigatory procedures as may be agreed upon in a treaty. One could then foresee that requests for complementary information to back up quite normal findings about toxicological work, pesticide production, etc., obtained by the verification methods, would be considered as a normal routine procedure. Such a procedure would probably also make it easier to secure co-operation with industries.

The way of circumventing the problem of false alarms would lie in the insight and acceptance of the fact that each verification method is in itself a weak instrument which only in exceptional cases can give a straight answer, and which normally provides incomplete answers. Thus, there should be no reason to look upon a single result as an alarm, but rather as part of the continuous information procedure.

Need to give alarm alleging that a party has violated a treaty will arise only when several or all verification methods concur to indicate the possibility of a treaty violation, when requests made by routine for complementary information are rejected without reason, or when the information given turns out to be inconsistent with other information obtained.

The remaining genuine uncertainty

It might be questioned whether the application of the "amplified verification" system has a reassuring rather than a deterring effect on a party to the treaty. This may be described in the following way:

When two potentially adverse parties adhere to a treaty prohibiting production of chemical warfare agents, this implies that both parties officially wish to uphold the treaty. Being signatories of the treaty, neither wishes to be exposed as violating the treaty ban. At the same time, neither can accept that the other party could secretly violate the treaty. Thus the primary need is to have a verification system sufficiently reliable to expose to some degree an adverse violator. If one of the parties feels reassured about these possibilities, he can abstain from a capability of waging chemical war himself for any of three reasons: (1) he does not wish to have such a capability; (2) he would not need it, since an adversary can be expected to be disclosed at an acceptable level of probability (provided, as is done here, that this gives himself time to take countermeasures); (3) he would himself suffer the same risk as the adversary of being exposed by the verification system. From this reasoning it can be inferred that the reassuring effect would come first and thus in itself be sufficient.

The situation would essentially be the same if one or both of the parties already possessed a war-waging capability with chemical agents before becoming parties to the treaty. A treaty prescribing destruction of stockpiles would require verification methods for this, as well as for other activities covered by the treaty. Thus, by definition, the verification effect would be amplified again by introducing another control activity.

Thus, if it is possible to construct a reasonably reassuring control system, the problem would revert to the genuine uncertainty of whether some other power - perhaps

a potential adversary - intends in the future to acquire a chemical war capability. It can be assumed that any party entering into a treaty would expect other parties to observe the treaty obligations. The genuine uncertainty referred to above would therefore only relate to a more distant future. To assess this remains a political task, where one would have to take into account the option offered by the withdrawal clause in the treaty.

Practical and political implications

It may be interesting not only to determine how successful a verification method may be in disclosing a forbidden activity which is in effect not likely to occur. As suggested above one could e.g. also introduce a concept implying that a verification method investigates some normally occurring activity which is likely to undergo some change if and when a violation of the treaty is being prepared or is already taking place. The control method could be designed to analyse certain relevant data. The efficiency might be expressed through the confidence which experts would have in the verification method as to its ability to perform its task.

Politically, this means that it would be difficult for a country to start an activity in the field of chemical warfare which could go on totally unnoticed: warning signs would be obtained, even if they might be explained away.

Should several warnings appear simultaneously, they should certainly, taken together, be sufficient to warrant an investigation, if such a procedure is provided for in the treaty, or to entitle any party to withdraw from the treaty. Since the result of the verification methods would be official and be known by all parties, it would be easy for all other parties to judge the fairness of a withdrawal.

This procedure should therefore be easier to apply in the event that a suspected violator was unwilling to explain the coincidence of several "warning signs" or vetoed an investigation.

A withdrawal clause similar to the one just discussed hypothetically is found in the first DPS ban on biological and chemical agents of warfare, the convention on biological and toxin weapons.

Conclusions

The over-all efficiency of the verification system of a treaty prohibiting DPS of chemical agents is increased by the use of several verification methods. The verification methods may not be exclusively aimed at detecting violations, but could

primarily be designed to detect, with known efficiency, changes in normal activities in the chemical field. Such changes might constitute warning signs. The occurrence of many warning signs on behalf of a party to the treaty, in connexion with unwillingness to explain them or to let an investigation take place, might enable other parties to withdraw from the treaty. This construction of the verification system makes it reassuring rather than deterring. In view of the fact that the use of chemical warfare agents is already forbidden by the Geneva Protocol of 1925, such a reassurance should be sufficient.